PINS & RECEPTACLES

MAXIMUM CONNECTIONS

MILL-MAX®

INTRODUCTION

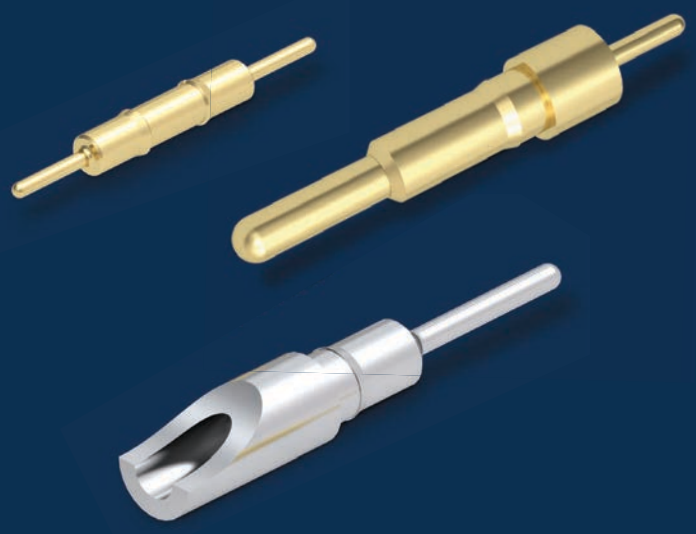
As a global industry leader, Mill-Max has provided reliable connector solutions for over 50 years. The machined pin and receptacle combination sets the benchmark for quality and continues to fulfill application requirements for a reliable, durable, and long-lasting connector solution. The high reliability and low electrical resistance properties of the Mill-Max pin and receptacle design ensures that they remain a dependable choice for engineers and designers for decades to come.

Benefits of using a machined contact:

- **Reliability:** Machined components are known for their reliability and long lifespan, making them a popular choice for a multitude of demanding applications.
- **Durability:** Made with high-quality materials that provide sufficient resistance to wear and tear, fit for use in harsh environments.
- **Versatility:** Mill-Max pins and receptacles are available in a range of sizes, shapes, and configurations, making them suitable for a variety of applications.
- **Repeatability:** The machining process allows tight control to be maintained over part production, ensuring repeatable components no matter the volume.
- **Ease of Use:** Designed for easy installation and removal, minimizing the risk of damage to the device, connector or PCB.
- **High Performance:** Machined pins have a high level of electrical and mechanical performance, ensuring a reliable connection between the device and the circuit.

Learn more at mill-max.com/intropins

THE MILL-MAX PIN



Key Features

- **Precision machined to extremely tight tolerances (up to .0005”)**
- **Diameters available from .008” up to .250”**
- **Three standard base material options to suit various applications - brass, phosphor bronze and tellurium copper**
- **Multiple termination styles available**
- **Various plating options available**
- **Custom designs welcome, starting from a low minimum order quantity of 1,000 pieces**

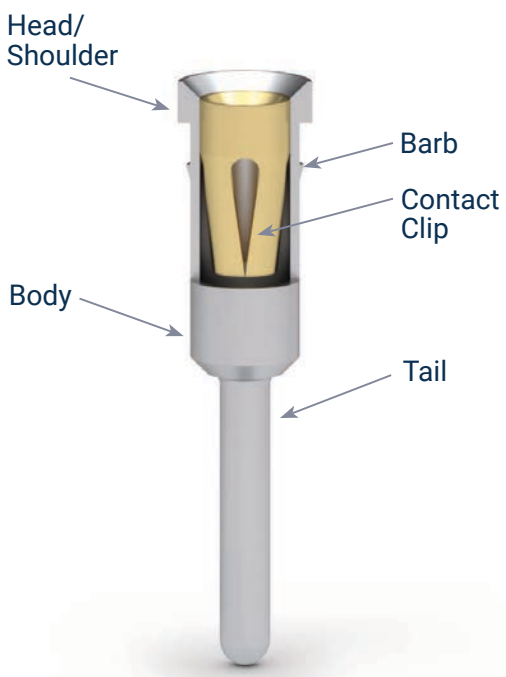
MEDICAL

Our high-performance products are suitable for a wide range of medical devices, such as patient monitoring apparatus, diagnostic equipment, cable interconnects and surgical tools, where reliability and precision are critical.

THE MILL-MAX RECEPTACLE

Enhancing Connectivity with Quality and Longevity

The Components of the Receptacle



The Mill-Max receptacle is an industry-renowned mainstay for designers who require the ultimate solution in connector quality and longevity. Occasionally referred to as PCB sockets, micro-plugs or connector jacks, machined receptacles from Mill-Max are known for their reliability and versatility in electronic design.

Key Features

- **Two-piece construction utilizing a machined shell and stamped contact clip**
- **Various plating options available for the internal contact clip and machined shell**
- **Numerous contact clip options, including high and low force options**
- **High-temperature contact clips available for elevated temperature (>150°C) environments and burn-in requirements**
- **Wide pin acceptance range with several interchangeable contact clips available**
- **Reliable functionality to a minimum 1,000 insertion/ extraction cycles**
- **Excellent performance under shock and vibration**

Learn more at mill-max.com/introreceptacles

VERTICAL INTEGRATION

Mill-Max retains full control over every process required to manufacture our products, from raw material to finished product. This unique ability allows us to maintain excellent lead times and quality control with a high level of customer service.

Machining | Electroplating | Contact Clip Stamping | Contact Clip Assembly | Quality Control | Tape and Reel Packaging | Warehousing and Shipping

THE MILL-MAX CONTACT CLIP

RELIABLE & VERSATILE CONNECTIONS

Inside every Mill-Max receptacle is a contact clip. This contact clip is a conductive, “multi-finger” progressive die stamping designed to engage with a range of mating pins to form a reliable electrical connection. The contact clip is press-fit into a precision machined shell to create a receptacle. With the ability to accept round, square, or rectangular leads, the Mill-Max contact clip has proven to be an extremely reliable and consistent way to connect critical components for several decades.

Mill-Max offers over 40 contact clip styles with pin acceptance ranging from .008” - .102”. In addition, there are numerous insertion force options and high temperature materials available.

Learn more at mill-max.com/thecontactclip

MATERIAL & PLATING OPTIONS

Material:

Beryllium Copper (BeCu) is the standard material for internal contact clips used in Mill-Max receptacles, and is known for its excellent electrical conductivity, mechanical strength, and high ductility. Our contact clips are heat-treated for optimal spring characteristics, making them ideal for pin insertion.

Learn more at mill-max.com/BeCuContacts

Beryllium Nickel (BeNi) is the material chosen for applications exposed to high-temperature environments such as downhole oil and gas exploration or “burn-in” systems (above 150°C).

Learn more at mill-max.com/BeNiContacts

Plating:

At Mill-Max, we understand that certain applications require a specific type and thickness of plating. With our in-house plating capabilities, we can tailor each part to meet your plating needs. We can apply several finishes of different plating materials such as Gold, Nickel, Copper, pure Tin/Tin-Lead to varying thicknesses.

AEROSPACE

Mill-Max provides pin and receptacle solutions in aerospace applications, including avionics, navigation systems and guidance systems, where durability and high-performance components are required.

WIRE TERMINATION FEATURES

Turret

A turret feature is used for wrapping wires for production or test purposes.

Soldercup

A soldercup feature enables soldering various wire sizes directly into the pin or receptacle.

Wrapost

A wrapost feature is used for wrapping wires for production or test purposes.

Crimp End

A crimp barrel feature is used for crimping wires to the individual pin or receptacle.

PRECISION MACHINING CAPABILITIES

PRESS-FIT FEATURES

Barb Feature

A barb feature is used for retention purposes in a plastic housing or drilled, non-plated circuit boards.

Knurl Feature

A knurl feature is used for anti-rotation retention purposes, used in conjunction with solder cups and right-angle pins or receptacles.

Polygon Feature

A Polygon feature is used for retention purposes in PCB-plated through-holes, providing stress relief during PCB insertion, creating an effective electro-mechanical fit.

Compliant Tail

A compliant tail feature is designed for a 'solderless' press-fit into plated through-holes. Allows for standard hole tolerances to be used.

Mill-Max has been a solutions provider for all manner of board level and wired connector solutions. Our precision machining expertise allows us to provide a full array of features to facilitate wire termination and press-fit options.

Learn more at mill-max.com/pinrecs_search

PRIMARY PIN & RECEPTACLE APPLICATIONS

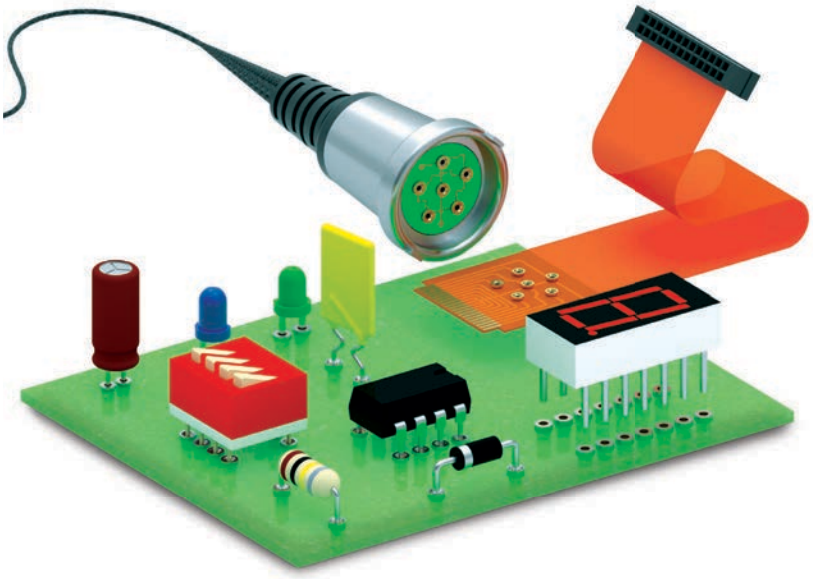
In the machined pin and receptacle mix, there are several product categories that have been developed by Mill-Max engineers to provide solutions that can overcome most PCB design and assembly challenges. Each category aims to solve a major PCB design obstacle faced by board level design engineers, as well as providing a unique benefit to enhance the development and quality of the overall system. This reduces the engineer's time and effort when considering interconnect solutions as a suitable option with components typically available "on-the-shelf" for immediate design integration.

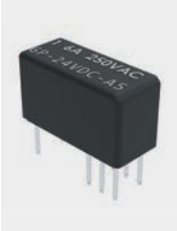
SOCKETING ELECTRICAL COMPONENTS

A primary use for the Mill-Max receptacle lies in the successful socketing of vital electrical components, with low contact resistance and a wide mating lead diameter range. These receptacles offer exceptional versatility, commonly used with components that have round, square or rectangular leads.

Examples include:

- Amplifiers
- Capacitors
- Controllers
- Crystal Oscillators
- DC/DC Converters
- Diodes (LEDs)
- Fuses
- Inductors
- Keyboard Keys
- Potentiometers
- Relays
- Resistors
- Sensors
- SIP/DIP ICs
- Switches
- Thyristors
- Timers
- Transformers
- Transistors





Learn more at mill-max.com/pinrecs_applications

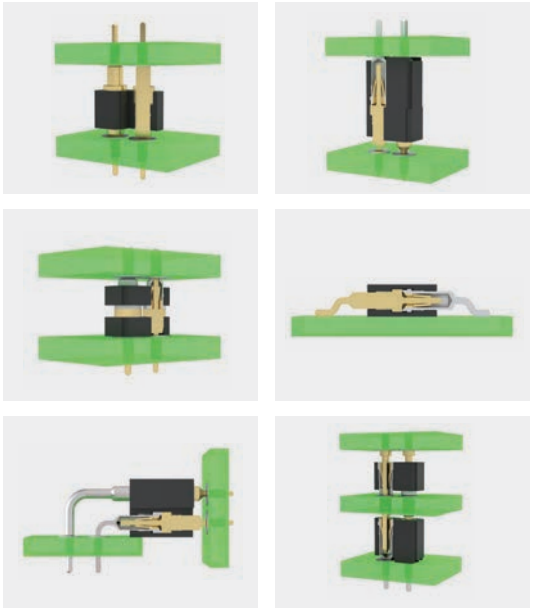
MILITARY

Our pins and receptacles are used in numerous military applications including missile guidance, communication systems, radar applications and many others where reliability is required in challenging and rugged environments.

BOARD-TO-BOARD & WIRE-TO-BOARD CONNECTIVITY

The Mill-Max pin and receptacle combination is also commonly used for connecting two (or more) printed circuit boards. Several configurations are possible due to our extensive product offering including parallel and perpendicular arrangements. These solutions are offered in a range of spacing requirements whether it be low-profile for stringent height requirements or tight pin-to-pin spacing for when board real estate is limited. A Mill-Max solution should always be strongly considered to ensure a quality connection with excellent longevity and electrical conductivity between boards.

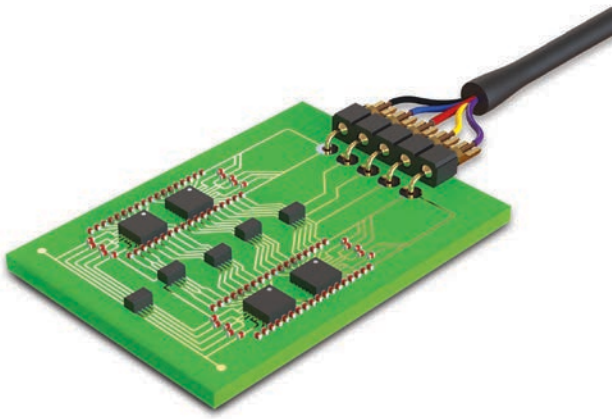
BOARD-TO-BOARD CONNECTIVITY



- **Permanent** board-to-board connection by soldering a vertical through-hole header between two boards.
- **Pluggable** board-to-board connection utilizing a vertical through-hole mount socket and mating header.
- **Low-Profile** board-to-board connection using a vertical surface mount header and socket combination.
- **Parallel** horizontal surface mount board-to-board connection using a 1mm 'Z-bend' header and socket combination (also know as a daisy-chain connection).
- **Perpendicular** through-hole connection using through-hole right-angle header and vertical mount socket.
- **Multiple** board stacking possibilities using Organic Fibre Plug® pass-through sockets.

Learn more at mill-max.com/pinrecs_b2b

WIRE-TO-BOARD CONNECTIVITY



As well as board-to-board connection options, Mill-Max offers several wire-to-board options for most industry standard wire sizes. As with our board-to-board offering, there are numerous connection options available for wire-to-board applications. The example shown here is a permanent, right-angle pin header option with solder cup termination for wire attachment. The part height provides a low-profile connection option with the right-angle pin termination eliminating the need to bend or manipulate the wires.

Learn more at mill-max.com/pinrecs_w2b

INDUSTRIAL CONTROL

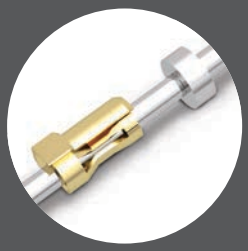
Our pin and receptacles have been used in industrial process and machine control systems for decades where durability is key.

ADDITIONAL APPLICATIONS

Welcome to our showcase of common applications and custom solutions we offer. Take a closer look at real-world examples where our products excel, providing reliable and innovative interconnect solutions.

Solder Protection

The unique open bottom "Organic Fibre Plug®" receptacle's plug barrier prevents solder from contaminating the internal contact clip. After soldering, the OFP barriers are pushed out when the mating header is inserted. When inserting into a board, it prevents any paste already applied from wicking up into the contact area. The plug also helps to facilitate packaging on tape and reel by providing a vacuum within the receptacle for easy reel removal.



Zero-Profile & Dual Entry Insertion

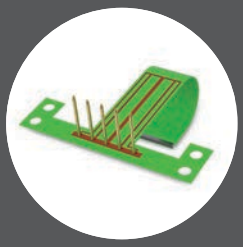
For applications with package size constraints including low-profile insertion requirements, we offer a contact clip type that makes optimal mechanical and electrical contact with reduced insertion length. These receptacles also provide zero-profile above-board connector protrusion. Additionally, these open-bottom receptacles allow components to be plugged in from either the top or bottom side of the PCB due to their dual-entry contact clip.

Solderless Assembly

For applications where board insertion is required without the use of soldering, Mill-Max developed the "compliant-tail" press-fit feature. The pin or receptacle can be pressed into a plated through-hole, creating a secure, gas-tight connection without soldering. A machined polygon feature can also provide an option for press-fitting a pin or receptacle into a PTH (plated-through-hole).

Swage Assembly

Mill-Max offers annealed swage type pins and receptacles for mechanically fastening to a PCB when a swage or rivet style assembly method is desired. The swage process is accomplished by using a punch and anvil tooling with a manual or automatic press.



Mating Flex to PCBs

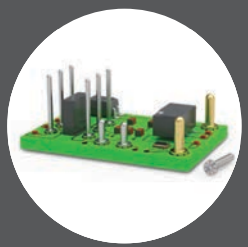
Nail-head style pins are often used to connect flexible circuit boards to rigid boards or other substrate features, providing an effective solution which is simple to process.

Component Leads

Electrical component manufacturers often use simple machined pin designs with features to enable over-molding or potting. The pins are assembled as the component termination leads, allowing them to become pluggable solutions for PCB insertion.

Metal Core PCBs

Mill-Max can design individually sleeved pins and receptacles to electrically isolate the part from surrounding conductive components or for use within a metal-core PCB, where the conductive pin or receptacle cannot make contact with the board itself but provide a "pass-through" electrical path.



Test Points

Machined pins are an invaluable method for board electrical test purposes. Test point pins are vital to ensure the correct circuitry and function of a finished PCB. Machined pins provide a time-saving method to complete this process due to their ease of handling and use.

Learn more at mill-max.com/pinrecs_applications

CUSTOM PARTS

Tailored Solutions for Your Unique Needs

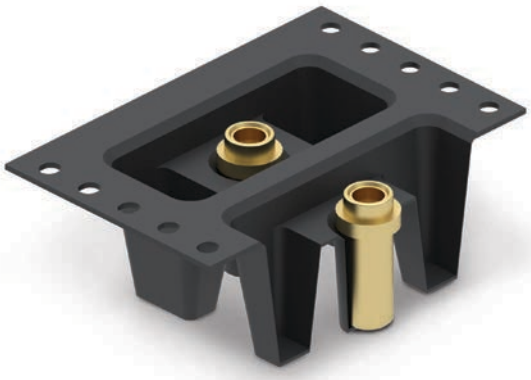
As a supplier we're renowned for our flexibility and responsiveness, as well as our dedication to delivering custom-designed pins and receptacles perfectly suited to your specific application requirements, regardless of volume. Our in-house engineering team provides expert guidance on optimal design practices and part features, ensuring seamless integration into your production process while keeping costs under control. Our swift turnaround times — from concept to final product delivery — make custom component creation a viable and efficient option.

Low MOQ & High-Volume Capabilities

We understand that not all projects require large production runs. That's why our minimum order quantity (MOQ) for custom machined pins or receptacles is just 1,000 parts, making us the preferred choice for low-volume and prototype production runs. However, we are equally equipped to handle large-scale orders, running into the tens of millions of parts per year, to fulfill the diverse needs of our customers. As the largest screw machine manufacturer in North America, our expansive capacity ensures we can meet your requirements at any scale.

Custom Options

- In-house plating capabilities allow us to plate to meet your specific, non-standard plating needs
- Materials — we can machine brass, phosphor bronze and tellurium copper where required
- Low MOQ of 1,000 pieces for a custom machined pin or receptacle

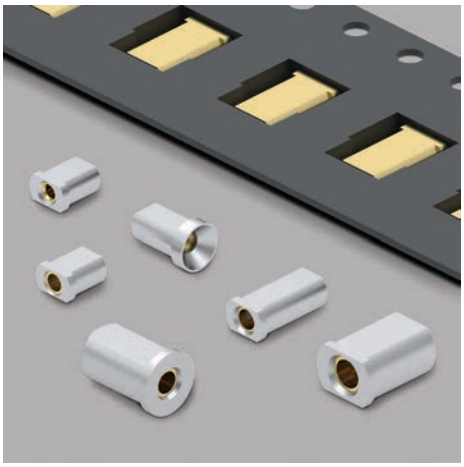


Learn more at mill-max.com/custompin

CONSUMER ELECTRONICS

Mill-Max pins and receptacles are often used in high-end consumer electronics as the need for high-density, low profile and reliable connections are required more often for new devices.

PACKAGING OPTIONS



Mill-Max can provide the majority of pin and receptacle parts on tape and reel when required, as well as providing parts in standard bulk packaging. We understand the need for efficient and economical production, which often includes automating the part placement process at high volume. We accommodate this by providing parts in carrier tape on industry standard 13" reels, manufactured to meet the guidelines of EIA-481-D. Full, in-house vertical integration allows Mill-Max to provide this option at low cost with short lead times, helping to reduce your overall assembly cost.

Conventional Receptacle Style (head-up orientation):

Mill-Max receptacles are the most amenable to tape and reel packaging. These parts are typically larger at the top and smaller at the bottom, allowing the part to sit snugly in the pocket with minimal lateral movement. Mill-Max receptacles with no tail and a closed bottom, or open bottom fibre plug type, fit into this category.

Surface Mount Receptacle Style (inverse orientation):

Surface mount style receptacles that require a flat bottom for PCB mounting can also be provided on tape and reel packaging with ease. The flat bottom parts offer a stable platform for tape packaging whilst leaving ample room for a nozzle to remove the parts at the tape pocket entrance.

Nail Head Pins:

Nail head pins can often be packaged on tape and reel packaging without issue. Whether they need to be packaged 'head-down' or 'head-up', most pin geometries can successfully be packaged on tape and reel despite their miniature size.

Double Tail Pins:

Mill-Max can successfully package double-tail pins on tape and reel, despite their awkward geometry for tape pocket loading and removal. Mill-Max can offer deep-drawn tape pockets for part stability and straightforward pocket removal.

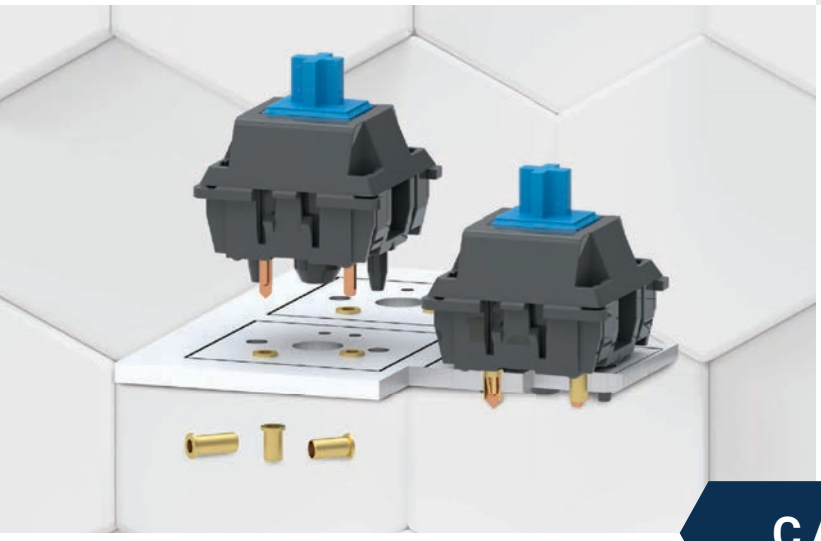
Horizontal Surface Mount Pins & Receptacles:

Horizontal surface mount pins and receptacles typically have flat surfaces and low profiles which makes them ideal for tape and reel packaging. We offer several parts on tape and reel in this mounting style.

Learn more at mill-max.com/pinrecs_options

Carrier

A world-renowned industrial control manufacturer needed to socket several industry standard relays on a process controller PCB. Individually placing the required Mill-Max receptacles was time-consuming, Mill-Max provided pre-loaded carriers with removable receptacles arranged to match the board footprint of the relay. Our carriers maintained part stability and greatly reduced the number of components being individually placed. A benefit is that the empty/used carriers are then returned to Mill-Max for a "reload" process, saving time and cost to produce new carriers.



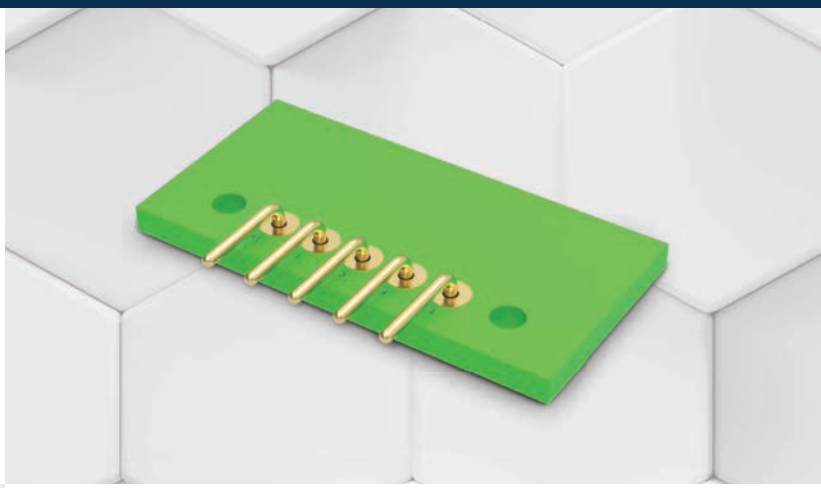
"Hot-Swap" Mechanical Keyboards

To Mill-Max, or not to Mill-Max — that is the question! Our receptacles have become so popular in making mechanical keyboards "hot-swappable" that we developed a receptacle design for this exact purpose. The phrase "to Mill-Max" a keyboard has since been coined and the part has proven to be extremely popular. This is a great example of Mill-Max's willingness to listen to customer feedback and respond swiftly with a new product to perfectly meet the market need.

CASE STUDIES

Non-Magnetic Application

A healthcare device manufacturer needed to connect a daughtercard to a PCB within an MRI machine enclosure. Crucially, the pins had to be non-magnetic to avoid disturbing the quality of the MRI image. Mill-Max provided a simple pin design provided with non-magnetic plating to overcome this hurdle. The parts have since been used to successfully make the board connection.



LED Board Application

An LED lighting company required two receptacles to be assembled into a PCB for a new LED light design. The board is a metal-core PCB made from aluminum. The receptacles needed to be insulated to prevent an electrical connection with the board itself to create a "pass-through" power connection. Mill-Max provided individually insulated receptacles using non-conductive plastic sleeves with success.

About Mill-Max

Mill-Max Manufacturing Corporation, an engineering and manufacturing company, is the largest manufacturer of precision-machined interconnect components–more than 100 million each week–in North America.

What We Offer

Mill-Max's interconnect components include precision-machined contact pins and receptacles, spring-loaded connectors, PCB pins and solder terminals, IC sockets, and board-to-board interconnects, all available in SMT and through-hole.

What Sets Us Apart

Mill-Max exercises total control from raw materials to finished product. Our 150,000-square-foot plant houses all facilities including engineering, customer service, sales and marketing, tooling, primary and secondary machining, stamping, electroplating, injection molding, and automatic assembly operations.

Our customer-driven philosophy means we welcome custom designs, regardless of volume, beyond the more than 20,000 standard products we offer in our catalog and website.

Our Focus

From order entry to product shipping, Mill-Max is focused on the total satisfaction of our customers. Our products are sold directly through our sales representative organizations and through a network of authorized distributors located throughout the U.S. and in various locations worldwide. Contact us at 516-922-6000 or via our online contact form.

Our commitment to excellence makes Mill-Max your source for maximum interconnect solutions.

WORLDWIDE DISTRIBUTION

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